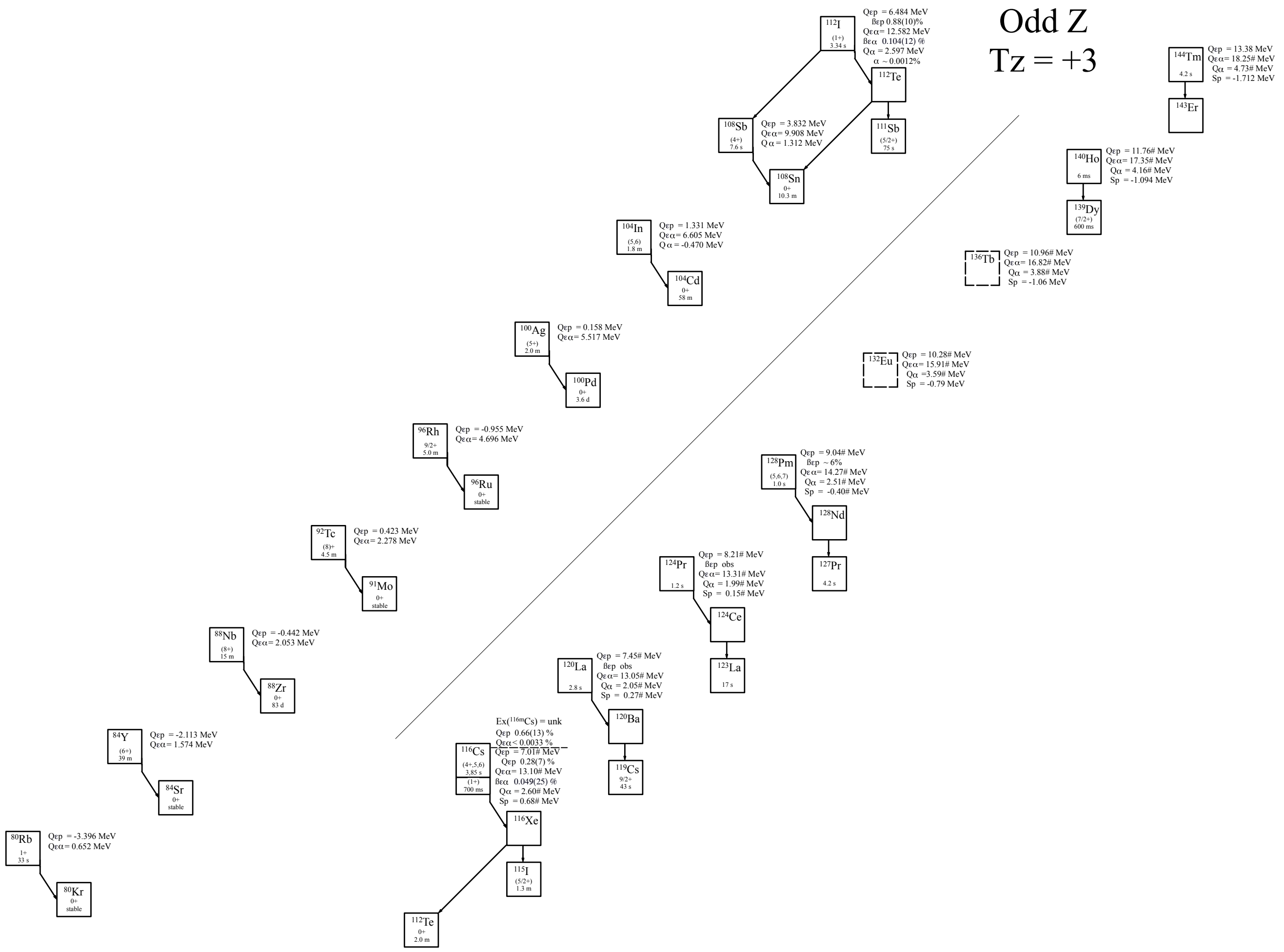

Fig. 1: Known experimental values for heavy particle emission of the odd-Z T_z= +3 nuclei.

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Table 1
Observed and predicted β-delayed particle emission from the odd-Z, T_z = +3 nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein. J$^{\pi}$values for ^{80}Rb, ^{84}Y, ^{88}Nb, ^{92}Tc, ^{96}Rh, ^{100}Ag, ^{104}In, ^{108}Sb, are taken from ENSDF.

Nuclide	Ex	J^{π}	$T_{1/2}$	Q$_{\varepsilon}$	$Q_{\varepsilon p}$	$BR_{\beta p}$	$Q_{\varepsilon 2p}$	$Q_{\varepsilon\alpha}$	BR$_{\beta\alpha}$	Experimental
^{80}Rb		1^+	33.4(7) s	5.718(2)	-3.396(2)	—	-9.728(2)	0.652(2)		[**1993Al03**]
^{84}Y		(6^+)	39(1) m	6.755(4)	-2.113(5)	—	-7.880(4)	1.574(4)		[**1981DeZD**]
^{88}Nb		(8^+)	14.56(11) m	7.46(60)	-0.442(58)	—	-6.225(60)	2.053(58)		[**2009Ga02**]
^{92}Tc		(8^+)	4.5(1) m	7.883(3)	0.423(4)		-4.781(3)	2.278(6)		[**1985Be12**]
^{96}Rh		6^+	9.9(1) m	6.393(10)	-0.955(11)	—	-5.852(10)	4.696(10)		[**1975Gu01**]
^{100}Ag		$(5)^+$	2.0(1) m	7.075(18)	0.158(20)		-4.491(8)	5.517(5)		[**1980Ha20**]
^{104}In		(5,6)	1.80(3) m	7.786(6)	1.331(7)		-2.858(6)	6.605(19)		[**1995Sz01**]
^{108}Sb		(4^+)	7.6(3) s	9.625(8)	3.832(11)		0.109(5)	9.098(6)		[**1997Sh13**]
^{112}I		(1^+)	3.42(11)s	10.504(13)	6.484(14)	0.88(10)%	4.201(17)	12.582(11)	0.104(12)%	[**1985Ti02**]
^{116}Cs		(1^+)	0.70(4) s	11.00(10)#	7.01(10)#	0.28(7)%**	5.27(10)#	13.10(10)#	0.049(25)%**	[**1977Bo28**, 1985Ti02, 1978Da07, 1978Ka17, 1976Bo36, 1975Bo11]
^{116m}Cs	0.10(6)*		3.85(13) s	11.08(10)#	7.11(10)#	0.66(13)%**	5.37(10)#	13.18(12)#	$<$0.0033%**	[**1977Bo28**, 1985Ti02, 1978Da07, 1978Ka17]
^{120}La			2.8(2) s	11.32(42)#	7.45(30)#	obs	5.93(30)#	13.05(30)#		[**1984Ni03**]
^{124}Pr			1.2(2) s	11.77(50)#	8.21(45)#	obs	6.88(40)#			[**1986Wi15**]
^{128}Pm			1.0(3) s	12.31(36#)	9.04(36)#	≈6%	8.02(30)#	13.31(50)#	14.27(42)#	[**2005Xu04**, 1999Xu05]
^{132}Eu				12.94(50)#	10.28(45)#		9.82(40)#	15.91(45)#		
^{136}Tb				13.19(58)#	10.96(54)#		10.90(54)#	16.82(58)#		
^{140}Ho			6(3) ms	13.51(64)#	11.52(58)#		11.76(54)#	17.35(58)#		[**1999Ry04**]
^{144}Tm		9^+***	$1.9^{+1.2}_{-0.5}$ μs	14.45(45)#	12.60(50)#		18.25(57)#	13.38(83)#		[**2005Gr32**]

* Excitation energy is unknown, Estimated from systematics to be 100(60) keV [2003Au02].

** There are large discrepancies between the three studies [1985Ti02], [1978Da07] and [1977Bo28]. The β-p to β-α ratios reported for the 3.85 s isomer are 200(80), 47(20 and $>$ 200 respectively. For the 0.7 s isomer, the ratio is 16(4) [1985Ti02], 4.7(18) [1977Bo28], and no value is reported by [1978Da07]. This is somewhat consistent if the value reported by [1978Da07] arises from a combination of the 0.7 and 3.8 s isomers. Individual branching ratios for β-p and β-α are not reported by [1985Ti02].

*** [2022Si09]

Table 2
Particle separation and emission from the odd-Z, T_z = +3 nuclei. Unless otherwise stated, all Q-values and separation energies are taken from [2021Wa16] or deduced from values therein.

Nuclide	S$_p$	BR$_{1p}$	S$_{2p}$	Q$_{\alpha}$	BR$_{\alpha}$	Experimental
^{80}Rb	5.022(4)	—	13.301(4)	-4.311(10)	—	
^{84}Y	4.386(8)	—	12.285(5)	-4.144(5)	—	
^{88}Nb	4.113(58)	—	11.466(60)	-4.702(58)	—	
^{92}Tc	4.006(7)	—	10.842(5)	-5.179(58)	—	
^{96}Rh	3.519(14)		10.107(11)	-3.187(10)	—	
^{100}Ag	3.244(7)	—	9.541(13)	-0.875(11)	—	
^{104}In	2.820(6)	—	8.514(10)	-0.470(8)	—	
^{108}Sb	1.222(8)	—	6.415(13)	1.312(8)		
^{112}I	0.765(12)	—	4.192(12)	2.957(12)	≈0.0012%	[**1985Ti02**, 1978Ro19]
^{116}Cs	0.68(10)#	—	3.98(18)#	2.60(10)#		[**1985Ti02, 1978Da07, 1977Bo28**, 1978Ka17]
^{116m}Cs	0.60(12)#	—	3.90(33)#	2.70(12)#		[**1985Ti02, 1978Da07, 1977Bo28**,1978Ka17]
^{120}La	0.27(36)#		3.74(30)#	2.05(32)#		
^{124}Pr	0.15(50)#		3.19(50)#	1.99(50)#		
^{128}Pm	-0.40(42)#		2.47(36)#	2.51(50)#		
^{132}Eu	-0.79(57)#		1.310(45)#	3.59(50)#		
^{136}Tb	-1.06(64)#		0.68(58)#	3.88(64)#		
^{140}Ho	-1.094(10)	100%	0.30(58)#	4.16(71)#		[**1999Ry04**, 1999BaZR, 1999RyZZ, 1998BaZU]
^{144}Tm	-1.712(16)	100%	-0.51(57)#	4.73(64)#		[**2005Gr32**, 2005Bi24]

Table 3
direct α emission from ^{112}I*, J^{π} = (1^{+}), $T_{1/2}$ = 3.42(11)s**, BR_{α} = ≈0.0012%***.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(abs)	J^{π}_{f}	$E_{daughter}$(^{139}Dy)	coincident γ-rays
2.987(30)	2.880(30)	≈0.0012%***	$(5/2^{+})$	0.0	—

* All values from [1981Sc17], except where noted.
** [1985Ti02].
*** [1978Ro19].

Table 4
direct p emission from ^{140}Ho*, J^{π} = $T_{1/2}$ = 6(3) ms, BR_{p} = 100%.

E_{p}(c.m.)	E_{p}(lab)	I_{p}(rel)	I_{p}(abs)	J^{π}_{f}	$E_{daughter}$(^{139}Dy)	coincident γ-rays
1.094(10)	1.086(10)	100%	100%	$(7/2^{+})$	0.0	—

* All values from [1999Ry04].

Table 5
direct p emission from ^{144}Tm*, J^{π} = 9^{+}, $T_{1/2}$ = $1.9\,^{+1.2}_{-0.5}$ μs, BR_{p} = 100%.

E_{p}(c.m.)	E_{p}(lab)	I_{p}(rel)	I_{p}(absb)	J^{π}_{f}	$E_{daughter}$(^{143}Er)	coincident γ-rays
1.430(25)	1.440(25)	≈ 29%	≈ 29%			
1.700(16)	1.712(16)	≈ 71%	≈ 71%			

* All values from [2005Gr32].

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